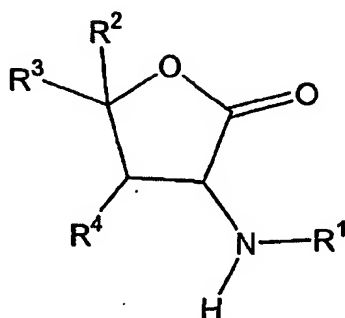


Claims:

1. Substituted γ -lactone compounds of the general formula I,

5



I

in which

- 10 R^1 denotes an optionally at least mono-substituted aryl or heteroaryl residue, an optionally at least mono-substituted aryl or heteroaryl residue attached via a C_{1-6} alkylene group, an optionally at least mono-substituted, saturated, branched or unbranched
- 15 aliphatic C_{1-10} residue, an optionally at least mono-substituted, at least partially unsaturated, branched or unbranched aliphatic C_{2-10} residue or an optionally at least mono-substituted, saturated or at least mono-unsaturated cycloaliphatic C_{3-8} residue,

20

- R^2 denotes an optionally at least mono-substituted, saturated, branched or unbranched aliphatic C_{1-10} residue or an optionally at least mono-substituted, at least partially unsaturated, branched or unbranched
- 25 aliphatic C_{2-10} residue,

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R³ denotes an optionally at least mono-substituted aryl residue,

5 R⁴ denotes H,

or

10 R³ and R⁴ together denote an optionally at least mono-substituted, saturated or at least mono-unsaturated aliphatic C₃₋₇ residue, with the proviso that the residue R² in this case denotes an optionally at least mono-substituted aryl residue, an optionally at least mono-substituted, saturated, branched or unbranched
15 aliphatic C₁₋₁₀ residue or an optionally at least mono-substituted, at least partially unsaturated, branched or unbranched aliphatic C₂₋₁₀ residue

20 in the form of the racemates, diastereomers or enantiomers thereof in the form of the base thereof or of a corresponding physiologically acceptable salt,

wherein the compounds of the general formula I, in which R¹ denotes a 2-, 4-, 6-trichlorophenyl or a
25 tosyl residue, R² a methyl residue, R³ a phenyl residue and R⁴ denotes H, are excepted.

2. Substituted γ -lactone compounds according to claim 1, characterised in that R¹ denotes an optionally at
30 least mono-substituted aryl or heteroaryl residue, preferably an optionally at least mono-substituted aryl residue.

3. Substituted γ -lactone compounds according to claim 1 or 2, characterised in that R^2 denotes an optionally at least mono-substituted, branched or unbranched C_{1-6} alkyl residue.

5

4. Substituted γ -lactone compounds according to one of claims 1 to 3, characterised in that R^3 denotes an optionally at least mono-substituted aryl residue and R^4 denotes H.

10

5. Substituted γ -lactone compounds according to one or more of claims 1 to 4:

15 3-(2-Chloro-4-fluoro-phenylamino)-5-(4-fluoro-phenyl)-
5-methyl-dihydro-furan-2-one,

5-Methyl-3-(4-phenoxy-phenylamino)-5-phenyl-dihydro-
furan-2-one,

20 3-(2-Chloro-phenylamino)-5-(4-fluoro-phenyl)-5-methyl-
dihydro-furan-2-one,

3-(4-Chloro-2-methyl-phenylamino)-5-methyl-5-phenyl-
dihydro-furan-2-one,

25

3-(2,4-Dichloro-phenylamino)-5-(4-fluoro-phenyl)-5-
methyl-dihydro-furan-2-one,

30 3-(4-Chloro-3-trifluoromethyl-phenylamino)-5-methyl-5-
phenyl-dihydro-furan-2-one,

3-(2,3-Dichloro-phenylamino)-5-(4-fluoro-phenyl)-5-
methyl-dihydro-furan-2-one,

3-(4-Iodo-phenylamino)-5-methyl-5-phenyl-dihydro-furan-2-one,

5 3-(4-Chloro-2-fluoro-phenylamino)-5-(4-fluoro-phenyl)-5-methyl-dihydro-furan-2-one,

3-(2-Chloro-4-methyl-phenylamino)-5-methyl-5-phenyl-dihydro-furan-2-one,

10

3-(2-Chloro-4-methyl-phenylamino)-5-(4-fluoro-phenyl)-5-methyl-dihydro-furan-2-one,

15 3-(3,5-Dichloro-phenylamino)-5-methyl-5-phenyl-dihydro-furan-2-one,

3-(3,5-Dichloro-phenylamino)-5-(4-fluoro-phenyl)-5-methyl-dihydro-furan-2-one,

20 3-(4-Bromo-2-chloro-phenylamino)-5-(4-fluoro-phenyl)-5-methyl-dihydro-furan-2-one,

4-(5-Methyl-2-oxo-5-phenyl-tetrahydro-furan-3-ylamino)-benzonitrile,

25

5-(4-Chloro-phenyl)-3-(4-iodo-phenylamino)-5-methyl-dihydro-furan-2-one,

30 5-(4-Chloro-phenyl)-3-(2,4-dichloro-phenylamino)-5-methyl-dihydro-furan-2-one,

5-(4-Chloro-phenyl)-3-(2-chloro-phenylamino)-5-methyl-dihydro-furan-2-one,

3-(4-Chloro-2-methyl-phenylamino)-5-(4-chloro-phenyl)-
5-methyl-dihydro-furan-2-one

5 3-(2-Chloro-4-fluoro-phenylamino)-5-(4-chloro-phenyl)-
5-methyl-dihydro-furan-2-one,

3-(4-Chloro-2-fluoro-phenylamino)-5-(4-chloro-phenyl)-
5-methyl-dihydro-furan-2-one,

10

3-(2-Chloro-4-methyl-phenylamino)-5-(4-chloro-phenyl)-
5-methyl-dihydro-furan-2-one,

15

5-(4-Chloro-phenyl)-3-(2,3-dichloro-phenylamino)-5-
methyl-dihydro-furan-2-one,

3-(4-Bromo-2-chloro-phenylamino)-5-(4-chloro-phenyl)-
5-methyl-dihydro-furan-2-one,

20

5-(4-Chloro-phenyl)-3-(3,5-dichloro-phenylamino)-5-
methyl-dihydro-furan-2-one,

3-(3,5-Dibromo-pyridin-2-ylamino)-5-methyl-5-phenyl-
dihydro-furan-2-one,

25

5-(4-Chloro-phenyl)-3-(3,5-dichloro-pyridin-2-
ylamino)-5-methyl-dihydro-furan-2-one,

30

5-(4-Chloro-phenyl)-5-methyl-3-(5-nitro-pyridin-2-
ylamino)-dihydro-furan-2-one,

3-(3-Chloro-2-methyl-phenylamino)-5-(4-iodo-phenyl)-5-
methyl-dihydro-furan-2-one,

5-(4-Bromo-phenyl)-3-(4-chloro-phenylamino)-5-methyl-
dihydro-furan-2-one,

5 5-(3-Chloro-phenyl)-3-(4-chloro-phenylamino)-5-methyl-
dihydro-furan-2-one,

3-(4-chloro-phenylamino)-5-(4-iodo-phenyl)-5-methyl-
dihydro-furan-2-one,

10

5-(4-Bromo-phenyl)-3-(2-iodo-phenylamino)-5-methyl-
dihydro-furan-2-one,

15

5-(3-Chloro-phenyl)-3-(2-iodo-phenylamino)-5-methyl-
dihydro-furan-2-one,

5-(4-Iodo-phenyl)-3-(2-iodo-phenylamino)-5-methyl-
dihydro-furan-2-one,

20

3-(2,4-Difluoro-phenylamino)-5-methyl-5-naphthalen-1-
yl-dihydro-furan-2-one,

5-(4-Bromo-phenyl)-3-(4-iodo-phenylamino)-5-methyl-
dihydro-furan-2-one,

25

5-(3-Chloro-phenyl)-3-(4-iodo-phenylamino)-5-methyl-
dihydro-furan-2-one,

30

3-(4-Iodo-phenylamino)-5-methyl-5-naphthalen-1-yl-
dihydro-furan-2-one,

5-(4-Bromo-phenyl)-3-(3,5-dichloro-phenylamino)-5-
methyl-dihydro-furan-2-one,

5-(3-Chloro-phenyl)-3-(3,5-dichloro-phenylamino)-5-methyl-dihydro-furan-2-one,

5 3-(3,5-Dichloro-phenylamino)-5-(4-iodo-phenyl)-5-methyl-dihydro-furan-2-one,

3-(3,5-Dichloro-phenylamino)-5-methyl-5-naphthalen-1-yl-dihydro-furan-2-one,

10

5-(3-Chloro-phenyl)-5-methyl-3-phenylamino-dihydro-furan-2-one,

15

3-(2-Bromo-4-methyl-phenylamino)-5-(4-iodo-phenyl)-5-methyl-dihydro-furan-2-one,

3-(2-Bromo-4-methyl-phenylamino)-5-methyl-5-naphthalen-1-yl-dihydro-furan-2-one,

20

3-(5-Chloro-2-methyl-phenylamino)-5-methyl-5-(5,6,7,8-tetrahydro-naphthalen-2-yl)-dihydro-furan-2-one,

3-(4-Bromo-2-fluoro-phenylamino)-5-isopropyl-5-phenyl-dihydro-furan-2-one,

25

5-(2,5-Dimethoxy-phenyl)-5-methyl-3-(5-trifluoromethyl-pyridin-2-ylamino)-dihydro-furan-2-one,

30

5-(3,5-Dimethoxy-phenyl)-5-methyl-3-(5-trifluoromethyl-pyridin-2-ylamino)-dihydro-furan-2-one,

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3-(3-Bromo-5-methyl-pyridin-2-ylamino)-5-(2-methoxy-phenyl)-5-methyl-dihydro-furan-2-one,

5 3-(3-Bromo-5-methyl-pyridin-2-ylamino)-5-(2,5-dimethoxy-phenyl)-5-methyl-dihydro-furan-2-one,

3-(3-Bromo-5-methyl-pyridin-2-ylamino)-5-(3,5-dimethoxy-phenyl)-5-methyl-dihydro-furan-2-one,

10 3-(5-Bromo-3-methyl-pyridin-2-ylamino)-5-(2-methoxy-phenyl)-5-methyl-dihydro-furan-2-one,

3-(2-Chloro-pyridin-3-ylamino)-5-(2-methoxy-phenyl)-5-methyl-dihydro-furan-2-one,

15 3-(5-Bromo-pyridin-2-ylamino)-5-(2,5-dimethoxy-phenyl)-5-methyl-dihydro-furan-2-one,

20 3-(3-Chloro-5-trifluoromethyl-pyridin-2-ylamino)-5-(2,5-dimethoxy-phenyl)-5-methyl-dihydro-furan-2-one,

5-(2-Methoxy-phenyl)-5-methyl-3-(pyridin-2-ylamino)-dihydro-furan-2-one,

25 3-[5-(2,5-Dimethoxy-phenyl)-5-methyl-2-oxo-tetrahydro-furan-3-ylamino]-pyrazole-4-carboxylic acid ethyl ester,

30 3-[5-(3-Bromo-phenyl)-5-methyl-2-oxo-tetrahydro-furan-3-ylamino]-pyrazole-4-carboxylic acid ethyl ester,

3-[5-(3-Bromo-phenyl)-5-methyl-2-oxo-tetrahydro-furan-3-ylamino]-5-methylsulfanyl-pyrazole-4-carbonitrile,

3-[5-(2,5-Dimethoxy-phenyl)-5-methyl-2-oxo-tetrahydro-furan-3-ylamino]-pyrazole-4-carbonitrile,

5 3-(4-Bromo-pyrazol-3-ylamino)-5-(3,5-dimethoxy-phenyl)-5-methyl-dihydro-furan-2-one,

3-(4-Bromo-5-phenyl-2H-pyrazol-3-ylamino)-5-(2-methoxy-phenyl)-5-methyl-dihydro-furan-2-one,

10

3-(8-Hydroxy-quinolin-2-ylamino)-5-(2-methoxy-phenyl)-5-methyl-dihydro-furan-2-one,

15 5-(2,5-Dimethoxy-phenyl)-3-(8-hydroxy-quinolin-2-ylamino)-5-methyl-dihydro-furan-2-one,

5-(2-Methoxy-phenyl)-5-methyl-3-(pyrazin-2-ylamino)-dihydro-furan-2-one,

20 5-(3-Bromo-phenyl)-5-methyl-3-(4-methyl-pyrimidin-2-ylamino)-dihydro-furan-2-one,

25 2-[5-(3,5-Dimethoxy-phenyl)-5-methyl-2-oxo-tetrahydro-furan-3-ylamino]-4-propyl-pyrimidine-5-carboxylic acid ethyl ester,

5-(2-Methoxy-phenyl)-5-methyl-3-(pyrimidin-2-ylamino)-dihydro-furan-2-one,

30 3-(4-Chloro-3-trifluoromethyl-phenylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

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3-(2-Chloro-phenylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

5 3-(2-Chloro-4-fluoro-phenylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

3-(4-Chloro-2-fluoro-phenylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

10 3-(2-Chloro-4-methyl-phenylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

15 3-(2-Oxo-5-phenyl-5-propyl-tetrahydro-furan-3-ylamino)-pyrazole-4-carboxylic acid ethyl ester,

3-(5-Hydroxy-4-phenylazo-pyrazol-3-ylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

20 3-(4-Bromo-5-phenyl-pyrazol-3-ylamino)-5-phenyl-5-propyl-dihydro-furan-2-one,

5-Methylsulfanyl-3-(2-oxo-5-phenyl-5-propyl-tetrahydro-furan-3-ylamino)-pyrazole-4-carbonitrile,

25 3-(5-Butyl-2-oxo-5-phenyl-tetrahydro-furan-3-ylamino)-pyrazole-4-carboxylic acid ethyl ester,

30 5-Butyl-3-(5-hydroxy-4-phenylazo-pyrazol-3-ylamino)-5-phenyl-dihydro-furan-2-one,

3-(4-Bromo-5-phenyl-pyrazol-3-ylamino)-5-butyl-5-phenyl-dihydro-furan-2-one,

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3-(5-Butyl-2-oxo-5-phenyl-tetrahydro-furan-3-ylamino)-
5-methylsulfanyl-pyrazole-4-carbonitrile,

5 3-(5-Butyl-2-oxo-5-phenyl-tetrahydro-furan-3-ylamino)-
pyrazole-4-carbonitrile,

5-Butyl-3-(2-phenoxy-phenylamino)-5-phenyl-dihydro-
furan-2-one,

10 5-Biphenyl-4-yl-3-(2,4-dichloro-phenylamino)-5-methyl-
dihydro-furan-2-one,

5-Biphenyl-4-yl-3-(2-chloro-phenylamino)-5-methyl-
dihydro-furan-2-one,

15 5-Biphenyl-4-yl-3-(2-chloro-4-fluoro-phenylamino)-5-
methyl-dihydro-furan-2-one,

20 3-(5-Biphenyl-4-yl-5-methyl-2-oxo-tetrahydro-furan-3-
ylamino)-pyrazole-4-carboxylic acid ethyl ester,

5-Biphenyl-4-yl-3-(4-bromo-5-phenyl-pyrazol-3-
ylamino)-5-methyl-dihydro-furan-2-one,

25 3-(3,5-Dichlorophenylamino)-5-methyl-5-phenyl-
dihydrofuran-2-one,

3-(3,5-Dichlorophenylamino)-5-methyl-5-o-tolyl-
dihydrofuran-2-one,

30 3-(3,5-Dichlorophenylamino)-5-(4-fluorophenyl)-5-
methyl-dihydrofuran-2-one,

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5-(2-Chlorophenyl)-3-(3,5-dichlorophenylamino)-5-methyl-dihydrofuran-2-one,

5 5-(4-Chlorophenyl)-3-(3,5-dichlorophenylamino)-5-methyl-dihydrofuran-2-one,

5-(3-Bromophenyl)-3-(3,5-dichlorophenylamino)-5-methyl-dihydrofuran-2-one,

10 5-(4-Bromophenyl)-3-(3,5-dichlorophenylamino)-5-methyl-dihydrofuran-2-one,

15 3-(3,5-Dichlorophenylamino)-5-(4-iodophenyl)-5-methyl-dihydrofuran-2-one,

3-(3,5-Dichlorophenylamino)-5-(2-methoxyphenyl)-5-methyl-dihydrofuran-2-one,

20 3-(3,5-Dichlorophenylamino)-5-(3-methoxyphenyl)-5-methyl-dihydrofuran-2-one,

3-(3,5-Dichlorophenylamino)-5-(4-methoxyphenyl)-5-methyl-dihydrofuran-2-one,

25 3-(3,5-Dichlorophenylamino)-5-(2,4-dimethoxyphenyl)-5-methyl-dihydrofuran-2-one,

30 3-(3,5-Dichlorophenylamino)-5-(2,5-dimethoxyphenyl)-5-methyl-dihydrofuran-2-one,

3-(3,5-Dichlorophenylamino)-5-(3,5-dimethoxyphenyl)-5-methyl-dihydrofuran-2-one,

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5-(Biphenyl-4-yl)-3-(3,5-dichlorophenylamino)-5-methyl-dihydrofuran-2-one,

5 3-(3,5-Dichlorophenylamino)-5-ethyl-5-phenyl-dihydrofuran-2-one,

3-(3,5-Dichlorophenylamino)-5-phenyl-5-n-propyl-dihydrofuran-2-one,

10 5-n-Butyl-3-(3,5-dichlorophenylamino)-5-phenyl-dihydrofuran-2-one,

15 3-(3,5-Dichlorophenylamino)-7a-phenyl-hexahydrobenzofuran,

3-(3,5-Dichlorophenylamino)-7a-(3-methoxy-phenyl)-hexahydrobenzofuran-2-one

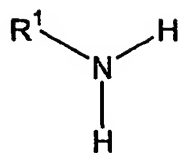
20 and

3-(3,5-Dichlorophenylamino)-8a-(3-methoxy-phenyl)-octahydrocyclo-hepta[b]furan-2-one

25 and the corresponding physiologically acceptable salts thereof, preferably the hydrochlorides thereof.

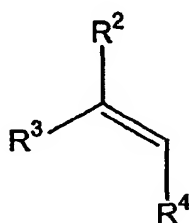
6. A process for the production of substituted γ -lactone compounds according to one of claims 1 to 5, characterised in that at least one amine component of
30 the general formula II,

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II

in which the residue R¹ has the meaning according to
claims 1 to 5, is reacted with glyoxalic acid and at
least one alkene component of the general formula III,



III

in which the residues R² to R⁴ have the meaning
according to claims 1 to 5, in the presence of at
least one inorganic and/or organic acid in an organic
solvent to yield at least one compound of the general
formula I according to claims 1 to 5 and this is
optionally purified using conventional methods and/or
optionally isolated using conventional methods.

7. A process according to claim 6, characterised in that the glyoxalic acid is used in the form of the monohydrate thereof or in form of an aqueous solution.
8. A process according to claim 6 or 7, characterised in that trifluoroacetic acid is used as the organic acid.

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9. A process according to one of claims 6 to 8,
characterised in that the temperature during the
reaction is 0 to 100°C, preferably 15 to 40°C.
- 5 10. A process according to one of claims 6 to 9,
characterised in that the duration of the reaction is
0.25 to 12 hours.
- 10 11. A process for the production of substituted γ -lactone
compounds according to one of claims 1 to 5,
characterised in that at least one amine component of
the general formula II according to claim 6 is reacted
with glyoxalic acid and at least one alkene component
of the general formula III according to claim 6 in an
15 organic solvent, optionally in the presence at least
one inorganic and/or organic acid with microwave
irradiation or with exposure to ultrasound, preferably
with microwave irradiation, to yield at least one
compound of the general formula I according to claims
20 1 to 5 and this is optionally purified using
conventional methods and/or optionally isolated using
conventional methods.
- 25 12. A process according to claim 11, characterised in that
the temperature during the reaction is 40 to 70°C,
preferably 45 to 60°C.
- 30 13. A pharmaceutical preparation containing at least one
substituted γ -lactone compound according to one of
claims 1 to 5 and optionally physiologically
acceptable auxiliary substances.

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14. A pharmaceutical preparation according to claim 13 for combatting pain.
- 5 15. A pharmaceutical preparation according to claim 14 for combatting chronic pain.
16. A pharmaceutical preparation according to claim 14 for combatting neuropathic pain.
- 10 17. A pharmaceutical preparation according to claim 13 for the treatment or prevention of neurodegenerative diseases, preferably of Alzheimer's disease, Parkinson's disease or Huntington's chorea.
- 15 18. A pharmaceutical preparation according to claim 13 for the treatment or prevention of stroke.
19. A pharmaceutical preparation according to claim 13 for the treatment or prevention of cerebral ischaemia.
- 20 20. A pharmaceutical preparation according to claim 13 for the treatment or prevention of cerebral infarct.
21. A pharmaceutical preparation according to claim 13 for the treatment or prevention of cerebral oedema.
- 25 22. A pharmaceutical preparation according to claim 13 for anxiolysis.
- 30 23. A pharmaceutical preparation according to claim 13 for anaesthesia.

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24. A pharmaceutical preparation according to claim 13 for the treatment or prevention of schizophrenia.
- 5 25. A pharmaceutical preparation according to claim 13 for the treatment or prevention of psychoses brought about by elevated amino acid levels.
- 10 26. A pharmaceutical preparation according to claim 13 for the treatment or prevention of AIDS dementia.
27. A pharmaceutical preparation according to claim 13 for the treatment or prevention of Tourette's syndrome.
- 15 28. A pharmaceutical preparation according to claim 13 for the treatment or prevention of inflammatory and/or allergic reactions.
- 20 29. A pharmaceutical preparation according to claim 13 for the treatment or prevention of depression.
- 30 30. A pharmaceutical preparation according to claim 13 for the treatment or prevention of mental health conditions.
- 25 31. A pharmaceutical preparation according to claim 13 for the treatment or prevention of epilepsy.
32. A pharmaceutical preparation according to claim 13 for the treatment or prevention of urinary incontinence.
- 30 33. A pharmaceutical preparation according to claim 13 for the treatment or prevention of pruritus.

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34. A pharmaceutical preparation according to claim 13 for the treatment or prevention of tinnitus.
35. A pharmaceutical preparation according to claim 13 for the treatment or prevention of diarrhoea.
36. Use of at least one substituted γ -lactone compound according to one of claims 1 to 5 for the production of a pharmaceutical preparation for combatting pain, preferably chronic or neuropathic pain.
37. Use of at least one substituted γ -lactone compound according to one of claims 1 to 5 for the production of a pharmaceutical preparation for the treatment or prevention of neurodegenerative diseases, preferably of Alzheimer's disease, Parkinson's disease or Huntington's chorea, for the treatment or prevention of migraine, stroke, cerebral ischaemia, cerebral infarct, cerebral oedema, schizophrenia, psychoses brought about by elevated amino acid levels, AIDS dementia, Tourette's syndrome, inflammatory and/or allergic reactions, depression, mental health conditions, epilepsy, urinary incontinence, pruritus, tinnitus, diarrhoea, for anxiolysis or for anaesthesia.